

THE BEAN BAG

A newsletter to promote communication among research scientists
concerned with the systematics of the Leguminosae/Fabaceae

Number 44

November 1996

From the Editors

Joseph H. Kirkbride, Jr., John H. Wiersema, and Roger M. Polhill

The Bean Bag is designed to promote communication among research scientists concerned with legume systematics. To achieve this goal *The Bean Bag* is issued in May and November of each year and features six columns: From the Editors, News (meetings, major events, announcements, etc.), Latin American Legume Report, Nodulation and Nitrogen Fixation (new nodulation records), Gleanings, and Recent Legume Literature. Data in the Gleanings column are derived from questionnaire sheets which Readers complete and return. If you have news about legume systematics, send it to us for this column. The Recent Legume Literature column contains published research papers of specific interest to *Bean Bag* Readers. Recent is defined as one year old. We rarely will publish a citation that is more than one year old. Specific interest to *Bean Bag* Readers is defined as research papers of interest to a worldwide group of legume systematic botanists. We encourage *Bean Bag* Readers to send us notices, observations, etc.

Diacritical marks can now be placed in *The Bean Bag*. If such marks should be placed in your name, address, publications, etc., please let us know. We are especially interested in correcting our Directory.

The Bean Bag and the Directory can now be delivered to Readers via e-mail. If you wish to have your copies e-mailed to you, please send the following standard e-mail message

To: beanbag-request@rbgkew.org.uk — **Subscribe BeanBag** <my e-mail address> .

Electronic copies of the current and past *Bean Bags* and the Directories (1987 through the present) can be obtained from the World Wide Web servers of the Royal Botanic Gardens, Kew, United Kingdom or Biodiversity and Biological Collections Web Server, University of Kansas Natural History Museum, Lawrence, Kansas, USA. Beginning in June, 1995, *The Bean Bag* is available on the World Wide Web at <http://WWW.rbgkew.org.uk:80/herbarium/legumes.html> or at <http://www.keil.ukans.edu/misc/news.html>.

Bean Bag address:

**Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB,
Great Britain**

Editorship of *The Bean Bag* Terminated at the USDA Agricultural Research Service

Joseph H. Kirkbride, Jr. and Barbara MacKinder

In early December 1996, the two senior editors of *The Bean Bag* were informed by their Research Leader, US Department of Agriculture, Agricultural Research Service, Systematic Botany and Mycology Laboratory, that they could not longer continue to edit *The Bean Bag*. The November 1996 issue, number 44, i.e., this issue, was near completion, and they were allowed to finish it.

In continuing support of *The Bean Bag*, The Royal Botanic Gardens (RBG), Kew has offered to take over the editorship on a trial basis but to reduce production annually to one issue in the autumn. Barbara Mackinder will be the editor, and it is to her that enquiries and offerings should be addressed in the first instance (B.Mackinder@rbgkew.org.uk). It is the intention of RBG Kew to continue to offer *The Bean Bag* in its current format although **Recent Legume Literature** will be compiled from *The Kew Record* (Kew's current awareness list of taxonomic literature). The Directory will be maintained as before, available as it is now in printed form and on the World Wide Web. No other changes are foreseen at this time.

Project Announcement: Geographical Distribution Patterns of Endophagous Insects of Afrotropical Fabaceae

Rainer Dolch

Fabaceae are one of the largest plant families worldwide. They are an important resource for many different species of insects and contribute vitally to arthropod diversity. In addition, Fabaceae are one of the most important plant families for human nutrition. Even those species that do not appear to be of economic importance could serve as refuges for economically important insects. Thus, studying insect-species richness associated with Fabaceae is essential for preserving both biodiversity and food security, especially in Africa. In 1997 the Department of Agroecology (Fachgebiet Agrarökologie) of the University of Göttingen (Germany) intends to carry out investigations on the geographical distribution patterns of Fabaceae-inhabiting insects in sub-saharan Africa, including 50 botanical institutions from the Sahel to the Cape.

To carry out this project we need to cooperate with African botanical institutions and would be grateful for their experience and support. Only standardized sampling of pods ensures reliable results to evaluate distribution patterns. Ripe pods of four different species of herbaceous Fabaceae will be collected in the field by institutional collaborators. Criteria for the plants to be sampled are abundance and life time. The four species should include: a rare annual herb; a rare perennial herb; an abundant annual herb; and, an abundant perennial herb. Preferably those four species should be from the same genus within each sampling area, but genera can differ between different sampling areas. Suitable genera are those with wide spread distributions such as *Crotalaria*, *Desmodium*, *Indigofera*, *Sesbania*, and *Tephrosia*. The ripe pods will be put into glass vials that have been sent in advance, and then returned to us. We welcome the cooperation of African colleagues! Address for further information: Fachgebiet Agrarökologie, Dipl.-Biol. Rainer Dolch, University of Göttingen, Waldweg 26, D-37073 Göttingen, Germany, Tel.: +49 551 39-2358, Fax: +49 551 39-8806, e-mail: rdolch@gwdg.de.

The Rupert Barneby Award

James L. Luteyn

The New York Botanical Garden is pleased to announce that Dr. Gwilym P. Lewis of the Royal Botanic Gardens, Kew, is the recipient of the 1995 *Rupert Barneby Award*. Dr. Lewis will be working on the legumes of Ecuador.

The New York Botanical Garden also invites applications for the *1996 Rupert Barneby Award*. The award of US\$1,000.00 is to assist researchers to visit The New York Botanical Garden to study the rich collection of Fabaceae. Anyone interested in applying for the award should submit their curriculum vitae and a detailed letter describing the project for which the award is sought. Travel to NYBG should be planned for sometime in 1997. The letter should be addressed to Dr. James L. Luteyn, Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY 10458-5126 USA, and received no later than December 1, 1996. Announcement of the recipient will be made by December 15th. Anyone interested in making a contribution to *The Rupert Barneby Fund in Legume Systematics*, which supports this award, may send their check, payable to The New York Botanical Garden, to Dr. Luteyn.

Improving food legumes for South American tropical areas

Two projects entitled *Genetic improvement of the food legumes of the genus Phaseolus for the lowland and highland tropical areas of Colombia and Peru* lead by Prof. Jean-Pierre Baudoin of the Faculté des Sciences Agronomiques de Gembloux, Belgium, in partnership with other scientific institutions in Colombia and Peru, and *Production of interspecific hybrids of Phaseolus and their characterization* lead by Prof. Otto J. Crocomo of the Universidade de São Paulo, Brasil, in partnership with other scientific institutions in Brasil and Belgium were carried out under the European Union (D.G.XII) STD2 scientific programme. The lack of varieties of major legume crops well adapted to particular environmental and agricultural conditions constitutes a great constraint to human nutrition and agricultural development in many areas of the world. The objectives of the two research projects were to obtain further progress in the breeding of either common beans or related species.

The first project dealt with the improvement of food legumes for both highlands and lowlands of tropical zones in Peru and Colombia. In highlands disease resistance, rusticity, and cold tolerance are considered the most important adaptive features. In Peruvian lowlands of desert coastal regions, the most valuable adaptive characters are drought tolerance, earliness, disease and pest resistance, and non viviparous seed, while in Colombian lowlands of the Atlantic coastal region, selection is mainly for a combination of both drought and heat tolerance, together with pest and disease resistances, including several non-identified viruses.

Though common beans constitute the most important crop of the genus *Phaseolus*, other species such as *P. coccineus* (Spanish bean), *P. polyanthus* and *P. lunatus* (Lima bean) are traditionally cultivated in Central and South America; in particular, both *P. coccineus* and *P. polyanthus* are well adapted for the highlands, while *P. lunatus* is considered a lowland species. Therefore, two major breeding strategies were envisaged: (i) intraspecific hybridization and selection within each of the above mentioned species and (ii) interspecific hybridization either between different cultivated species or between cultivated species and their wild relatives, to transfer useful traits into the cultivated species. The research project involving the Faculté des Sciences Agronomiques de Gembloux (Belgium), the Instituto Colombiano Agropecuario (Colombia) and the Universidad Nacional Agraria La Molina (Peru) faced several important questions regarding both breeding strategies.

In order to achieve a better insight into the genetic diversity of the genus *Phaseolus*, the electrophoretic patterns of molecular markers, such as seed storage proteins and chloroplast restriction fragments, were analyzed. At the interspecific level a clearer picture of the phyletic relationships within the complex *P. vulgaris*-*P. coccineus*-*P. polyanthus* was obtained. In particular, it was possible to delimitate three major groups of taxa: a single-species group consisting of *P. glabellus*, a species from the Sierra Madre Oriental in Mexico and known to be very well adapted to humid highland forests; a second group including *P. vulgaris*, *P. polyanthus*, *P. costaricensis* and the natural hybrid *P. vulgaris* x *P. polyanthus*; and a third group including *P. coccineus* and the natural hybrid *P. coccineus* x *P. polyanthus*. At the intraspecific level, the presence of significant unexplored genetic variability within *P. coccineus*, *P. polyanthus* and *P. lunatus* was demonstrated.

Editors: This information was circulating on the Internet without author attribution.

Nodulation and Nitrogen Fixation

Legume Nodulation Reports not in Allen and Allen (1981)

Taxon	Status ¹	Nodule ² Shape	Source ³
<i>Acacia multipinnata</i> Ducke	+		2
<i>Acacia polyphylla</i> DC.	-		2
<i>Acosmium nitens</i> (Vogel) Yakovlev	+		2
<i>Andira parviflora</i> Ducke	+		2
<i>Apuleia leiocarpa</i> (Vogel) Macbr.	-		2
<i>Batesia floribunda</i> Spruce ex Benth.	-		2
<i>Bauhinia angularis</i> Harms ex Glaziov (= <i>Bauhinia angulicaulis</i> Harms)	-		2
<i>Centrolobium paraense</i> Tul.	+		2
<i>Cynometra spruceana</i> Benth. var. <i>phaseolocarpa</i> (Hayne) Dwyer	-		2
<i>Dioclea bicolor</i> Benth.	+		2
<i>Dioclea glabra</i> Mart. ex Benth.	+		2
<i>Dioclea virgata</i> (L. Rich.) Amshoff	+		2
<i>Elizabetha coccinea</i> Benth.	+		2
<i>Eperua duckeana</i> Cowan	-		2
<i>Eperua glabriflora</i> (Ducke) Cowan	-		2
<i>Hymenolobium petraeum</i> Ducke	+		2
<i>Inga alba</i> (Sw.) Willd.	-		2
<i>Inga myriantha</i> Poeppig (= <i>Inga umbellifera</i> (Vahl) DC.)	-		2
<i>Machaerium floribundum</i> Benth.	+		2
<i>Neonotonia wightii</i> (Wight & Arn) Lackey	+		1
<i>Ormosia coarctata</i> Jackson	+		2
<i>Ormosia costulata</i> (Miq.) Kleinhootne	+		2
<i>Ormosia flava</i> (Ducke) Rudd	+		2
<i>Ormosia paraensis</i> Ducke	+		2
<i>Peltogyne gracilipes</i> Ducke	-		2
<i>Peltogyne paniculata</i> Benth. subsp. <i>pubescens</i> (Benth.) M.F. da Silva	-		2
<i>Peltogyne venosa</i> (Vahl) Benth. subsp. <i>densiflora</i> (Spruce ex Benth.) M.F. da Silva	-		2
<i>Platymiscium paraense</i> Huber (= <i>Platymiscium ulei</i> Harms)	+		2
<i>Sclerolobium chrysophyllum</i> Poepp. & Endl.	+		2
<i>Sclerolobium paraense</i> Huber	+		2
<i>Swartzia laurifolia</i> Benth.	+		2
<i>Swartzia laxiflora</i> Bong. ex Benth.	+		2
<i>Tachigalia paniculata</i> Aubl.	+		2
<i>Zollernia paraensis</i> Huber	+		2
<i>Zornia latifolia</i> Smith	+		2

¹Status: +, root nodules reported as present; -, root nodules reported as absent.

²Nodule shape: Ae, aescynomenoid; As, astragaloid (now referred to as caesalpinoid by Corby); Cr, crotalaroid; CrB, branched crotalaroid; CrS, simple crotalaroid; De, desmodioid; Gl, globose; Lu, lupinoid; Mu, mucunoid.

³Source:

1. Crespo, G., T.E. Ruiz, and G. Febles. 1995. Agronomy of tropical perennial legumes. Cuban Journal of Agricultural Science 29(2): 119-131.

2. Souza, A.G. de, M.F. da Silva, and F.W. Moreira. 1994. Capacidade de nodulação de cem leguminosas da Amazônia. Acta Amazonica 24(1/2): 9-18.

GLEANINGS

Eds. Note: Proper names in all capital letters are *Bean Bag* Readers. Their full names and addresses are listed in the May 1995 *Bean Bag* Directory and are available on the WWW server of the Royal Botanic Gardens, Kew, United Kingdom and the Biodiversity and Biological Collections Web Server, University of Kansas Natural History Museum, Lawrence, Kansas, USA, see **From the Editors** for their URLs.

ALBUQUERQUE is now working on the edible fruits of the Amazon, including many legumes. He needs references on edible fruits.

ALONSO-REYES is collecting and isolating Cuban rhizobium strains from soil low in phosphorus. He needs techniques for the identification and preservation of rhizobium isolates.

ARAMBARRI is determining *Lotus* species from the Mexican flora and continuing to work on the phylogenetic relations of Old World *Lotus* species. She needs herbarium specimens of *L. strigosus*, *L. strigosus* var. *hirtellus*, and *L. strigosus* var. *tomentellus*, and offers seeds of *Leucaena leucocephala* and *Sesbania punicea*.

ARONSON is conducting ongoing studies of *in situ* nitrogen fixation by woody and herbaceous Chilean legumes.

BENNETT is continuing her research on the ecogeography of *Medicago* and *Vicia narbonensis* complex using geographical information systems (GIS), her search for climatic homologues with Australia, and her study of genetic variation of naturalized *Trifolium glomeratum* in Western Australia.

BEYRA-MATOS submitted a manuscript of a taxonomic study for tribe Aeschynomeneae for Cuba in December 1995. It included 7 genera and 35 species with distribution maps, illustrations, descriptions, dichotomous keys, synonymy, and chemical, cytological, palynological, phenological, ecological, and ethnobotanical data. She is now working on a phenetic and phylogenetic study of subtribe Ormocarpaceae (Aeschynomeneae) and the foliar and fruit anatomy of the Cuban species of *Belairia* and *Pictetia*. She needs fresh and herbarium material of Cuban Fabaceae.

BRIZUELA is working on *Prosopis* for the "Flora Chaco."

BURGHARDT (New Reader) is working on *Prosopis* and *Phaseolus* seed proteins.

CHANDLER is working on *Daviesia* and *Gastrolobium* (Mirbelieae) and Fabaceae for ILDIS.

CHEN, Tao, (New Reader) is working on the taxonomy of Asiatic species of *Crotalaria* and *Ormosia*. He needs fresh leaves in silica gel of *Ormosia* species from America and Asia, with vouchers, and offers general collections of Chinese plants.

COMBES needs material of *Lathyrus cicera*, *L. grandiflorus*, *L. heterophyllus*, *L. latifolius*, *L. sativus*, *L. sylvestris*, and *L. tuberosus* and *Phaseolus vulgaris* resistant to *Acanthoscelides* (Bruchidae), and offers accessions of the same species, except *L. grandiflorus*.

CUBERO is doing chromosome mapping of *Cicer arietinum* and *Vicia faba* and is also working on their molecular markers. He needs *Vicia bithynica*, *V. hajastana* (= *V. anatolica*), and *V. melanops*, and offers wild annuals and cultivated *Cicer* and wild and cultivated *Vicia faba*.

DENARIE (New Reader) is studying the Nodulation (Nod) factors that are synthesized by *Rhizobium*, *Bradyrhizobium*, *Azorhizobium*, and *Sinorhizobium*. Nod factors are lipo-chitoooligosaccharide signals that are involved in the specific recognition of the legume host and the induction of nodules. While studying the structure of Nod factors, they have discovered that their structure is related to the taxonomy of the host legume, not to the bacterium. For example, the various rhizobia that nodulate tribes Cicereae, Galegeae, Trifolieae, and Vicieae produce Nod factors which are acylated by specific poly-unsaturated fatty acids. Similar Nod factors are not produced by rhizobia that nodulate legumes which are

not derived from putative galeoid ancestors. They want to contact taxonomists who might be interested in exchanging ideas concerning the possibility of using Nod-factor structure to clarify legume taxonomy, especially relationships between the Loteae and the galeoid complex.

DIPAOLA (New Reader) works in the manufacture of nutritional supplements. Alfalfa is grown and processed for its vitamins, and soy proteins are also used.

ESPINOSA-HERNANDEZ is studying the effects of interplanting *Lupinus arboreus* and *Urtica dioica* on their growth and acquisition of phosphorus.

GRAVES is evaluating germplasm of *Vigna unguiculata* (cowpeas) as green manure in the desert agricultural region of southern California. He needs rhizobium inoculants for *Hedysarum carnosum*, *H. flexosum*, *H. spinosissimum*, *Medicago noeana*, and *M. lacinata*, and offers seeds of the same species and many others from the Mediterranean region or zone.

GUNN is working on legume seeds and fruits which drift in ocean currents. See KIRKBRIDE.

HU is now working on the molecular phylogenetics of Millettieae, focusing on *Millettia*. He needs seeds of *Millettia* and related genera, such as *Derris* and *Lonchocarpus*.

JAAKA is continuing isozyme studies among *Vigna* and *Vicia* species.

KIRKBRIDE, GUNN, and Anna Weitzman have finished data collection for the third volume on legume fruits and seeds for the genera of Faboideae. They hope to submit the manuscript to the ARS, Technical Editing Unit early next year for publication as a *USDA Technical Bulletin*. They are also planning on consolidating and updating the data in DELTA format and the illustrations for all three subfamilies and publishing them on a CD-ROM.

LADIPO is collecting annual legume species for short rotation fallow systems in west and central Africa. He needs tropical herbaceous legume species, and offers various west African species for research, including shrubs, trees, and herbs.

LARSEN, Kai, and S.S. LARSEN have completed their revision of *Bauhinia* for *Flora Malesiana*, see Ding Hou in **Recent Legume Literature**. They wish to thank the following herbaria for their collaboration during visits (marked with an asterisk) and/or for the loan of material: A, ABD, AD, B, BM*, BK*, BKF*, BO*, BR, BRI, C*, CAL, CANB, DD, E*, FHO, G*, GB, GH, HBG, IBSC*, K*, KEP*, KLU*, KUN, KYO*, L* LE*, M, MA*, MEL, MO*, MU, NSW, NY, OXF, P*, PE*, PNH, PR, PRC, S*, SAN, SAR, SING*, TI*, U, US, and W.

LAWLOR (New Reader) is working with molecular markers for selection of *Cicer arietinum* cultivars with *Helioverpa* resistance and tolerance to low temperature. She will be conducting this work from July 1996 to June 2000.

Maquet, Alain, is studying the phytogeography of American *Phaseolus lunatus* (lima bean) in the frame work of *in situ* conservation. He is seeking information on recent *Phaseolus* germplasm collection and floristic and herbarium data. He is interested in obtaining references on *Phaseolus* germplasm not available in Europe. His address is: Phytotechnie des Regions Intertropicales, "Agronomie, Economie et Developpement," Faculte Universitaire des Sciences Agronomiques, Passage des Desportes, 2, B-5030, Gembloux, Belgique, telephone: 32-81-62-21-14, FAX: 32-81-61-45-44, e-mail: phytotrop@fsagx.ac.be.

MENDEZ is doing the varietal and agronomic characterization of *Bituminaria bituminosa*, "tedera," from the Canary Islands as forage. She needs seeds of *B. bituminosa*, and offers seeds of leguminous shrubs from the Canary Islands.

Oxford Forestry Institute offers copies of its Annual Report.

Pennington, Terry, has completed his monograph of *Inga*, and it will shortly be published by the Royal Botanic Gardens, Kew.

POKLE has started a revision of *Alysicarpus* using a taxonomic and biosystematic approach. He needs herbarium material of *Alysicarpus*, especially from Australia, South Africa, tropical America, and Yunnan, China, and he offers herbarium material of Indian legumes, especially *Acacia*, *Caesalpinia*, *Cassia*, *Crotalaria*, *Desmodium*, *Indigofera*, *Mimosa*, and *Tephrosia*.

TUCKER is working on convergence in legume flower structure and on developmental timing of floral specializations in Amherstieae/Detarieae and Cercideae. She needs very young bud material, liquid-preserved in formalin-acetic acid-alcohol, Kew mixture, or 70% alcohol, of taxa of Amherstieae/Detarieae that either lack some floral organs (sepals, petals, <10 stamens) usually present in other legumes or have numerous stamens (over 12-13) per flower. All sizes of buds, from youngest tight inflorescences, are needed in the collection, as well as a few open flowers. She offers reprints and can make collections of some native California legumes and introduced Mediterranean, tropical, or subtropical legumes.

QUEIROZ is revising *Camptosema* (Phaseoleae).

SAVARIMUTHU is working on the biotechnological aspects of insect-seed interactions in pulses.

SCHULTZE-KRAFT is now working on the taxonomy and biogeography of *Centrosema*, genetic resources and amphicarpy of tropical Fabaceae, and biogeography of *Stylosanthes*.

SOKOLOFF is now studying the fruit anatomy of *Antopetita* and *Ornithopus* and the taxonomy of several genera related to *Anthyllis*. He needs seeds, fruits, and herbarium material of Coronilleae and Loteae and publications on the taxonomy and fruit morphology of Loteae and related tribes. He offers herbarium specimens of Russian *Anthyllis* and vascular plants from European Russia, especially from the Murmansk region and Kazelia, and reprints of his publications.

THOTHATHRI is studying the Fabaceae of West Bengal, India. He needs reprints of Asiatic legumes, and offers the same for Asiatic and Indian legumes on their taxonomy, systematics, and revisionary studies.

VANDERBORGHT is maintaining a large collection of wild *Phaseolus* and *Vigna* species. He needs and offers material of the same with passport data.

VAN DER MAESEN needs material of *Dunbaria* and *Flemingia*.

VIDAL is still doing editorial work on volume 29 of the *Flore du Cambodge, du Laos et du Viêt Nam* which includes Dalbergieae and Millettieae. Publication is expected during 1997.

Weitzman, Anna, see KIRKBRIDE.

RECENT LEGUME LITERATURE

Eds. Note: Author names in all capital letters are *Bean Bag* Readers. Their full names and addresses are listed in the May 1995 *Bean Bag* Directory and are available on the WWW server of the Royal Botanic Gardens, Kew, United Kingdom and the Biodiversity and Biological Collections Web Server, University of Kansas Natural History Museum, Lawrence, Kansas, USA, see **From the Editors** for their URLs. Correspondence about their articles should be sent directly to them. Abbreviations for serial publications follow Botanical-Periodicum-Huntianum/Supplementum (Hunt Institute for Botanical Documentation, 1991).

Aarssen, L.W., I.V. Hall, and K.I.N. Jensen. 1995. The biology of Canadian weeds. 76. *Vicia angustifolia* L., *V. cracca* L., *V. sativa* L., *V. tetrasperma* (L.) Schreb., *V. villosa* Roth. Pp. 209-235 in P.B. Cavers, ed., The biology of Canadian weeds: Contributions 62-83. The Agricultural Institute of Canada: Ottawa, Ontario, Canada.

Adams, S. 1996. Special legumes may be an unopened medicine chest. Agric. Res., U.S.D.A. 44(11): 12-15. Popular article on USDA special-purpose legume collection.

- Ahmad, M., D.L. McNeil, A.G. Fautrier, K.F. Armstrong, and A.M. Paterson. 1996. Genetic relationships in *Lens* species and parentage determination of their interspecific hybrids using RAPD markers. *Theor. Appl. Genet.* 92(8): 1091-1098.
- Ahmed, M.F. and W.K. Taia. 1994. Pod morphological study within the Egyptian *Medicago* L. species. *Alexandria J. Agric. Res.* 39(3): 611-630. With Arabic summary.
- Akbayin, H., R. Demir, and A.S. Ertekin. 1994. Solution of some taxonomic problems in *Medicago rigidula* (L.) All. varieties by using discriminant analysis technique. *Turk. J. Bot.* 18(6): 481-488. With Turkish summary.
- Akeroyd, J.R. 1996. Coastal ecotypic variants of two vetches, *Vicia sepium* L. and *V. sylvatica* L. (Fabaceae), in Britain and Ireland. *Watsonia* 21(1): 71-78. Recognized as distinct varieties, with one new name proposed.
- Alessandrini, A. 1995. Noteworthy finds for the flora of Emilia-Romagna. *Arch. Geobot.* 1(1): 77-78. Includes *Lathyrus filiformis*, *Hedysarum hedysaroides*, *H. humile*, and *Astragalus sempervirens* ssp. *gussonei*.
- Allen, L. 1995. Noteworthy collections: Utah. *Madroño* 42(1): 83. Of *Oxytropis*.
- Annicchiarico, P. and E. Piano. 1995. Variation within and among Ladino white clover ecotypes for agronomic traits. *Euphytica* 86(2): 135-142.
- Aparicio, A. and R. Guisande. 1995. Contribuciones a la flora vascular de Andalucía (España) y del Rif (Marruecos): 33. Ecología y conservación de *Echinopartum albigicum* Talavera and Aparicio (Genisteae, Fabaceae). *Acta Bot. Malac.* 20(0): 298-301.
- Arduin, M. and J.E. Kraus. 1995. Anatomia e ontogenia de galhas foliares de *Piptadenia gonoacantha* (Fabales, Mimosaceae). *Bol. Bot. Univ. São Paulo* 14: 109-130.
- Arevshatyan, I.G. 1995. Revision of *Astragalus* (Fabaceae) from Armenia: sections *Chlorosphaerus* and *Hololeuce*. *Bot. Zhurn. (St. Petersburg)* 80(4): 96-101.
- Ashrafunnisa and T. Pullaiah. 1995. Embryology of *Indigofera* (Fabaceae). *Taiwania* 40(4): 391-402. With Chinese summary.
- ASMUSSEN and LISTON. 1996. Intrageneric phylogeny of *Lathyrus* (Fabaceae): chloroplast DNA restriction site data and previous classifications. *Amer. J. Bot.* 83(6S): 138. (abstract)
- Author unknown. 1996. Black acacia - data sheet. *Bois Forêts Trop.* 248: 61-62. In French.
- Aziz, S. and M.A. Khan. 1994. Life history strategies of *Tephrosia strigosa* Willd.: a desert summer annual. *Bangladesh J. Bot.* 23(2): 139-146.
- Baatout, H. 1995. Morphological contrasts between *Hedysarum spinosissimum* ssp. *spinosissimum* and ssp. *capitatum* warrant recognition of separate species. *Canad. J. Bot.* 73(4): 566-572.
- Badr, A., M.A. Hamoud, and H.A. El-Rabey. 1996. Chromosomal studies in the Egyptian flora V. Chromosomal relationships in the genus *Astragalus* L. (Fabaceae) and their taxonomic inferences. *Cytologia* 61(1): 105-111.
- Bakar, B.B., H.N. Wati, and M.A.H. Mohamed. 1996. The genus *Mimosa* with special reference to *M. quadrivalvis* L. var. *leptocarpa* (DC.) Barneby, a new species record for the weed flora in Malaya. *Biotropia* 9: 38-52.
- Bala, S. and D.K. Jain. 1994. Leaf architecture in Indian species of *Bauhinia* L. and their taxonomic significance. *Acta Bot. Indica* 22(2): 257-265.

- BANDYOPADHYAY and THOTHATHRI. 1996. Stomata on seed of *Bauhinia purpurea* L. (Leguminosae: Caesalpinioideae). J. Bombay Nat. Hist. Soc. 93(1): 115-116.
- BANDYOPADHYAY and THOTHATHRI. 1996. SEM studies on the testa surface pattern of some species of *Bauhinia* (Leguminosae: Caesalpinioideae). J. Bombay Nat. Hist. Soc. 93(1): 116-118.
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